

APPRENTICESHIP TRAINING

IRONWORKER Metal Building Systems Erector Program

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IRONWORKER
Metal Building Systems Erector

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Apprenticeship and Industry Training System

Apprenticeship is post-secondary education with a difference. It helps ensure Alberta has a steady supply of highly-skilled employees, the foundation of our economy's future health and competitiveness.

Apprentices in more than 50 trades and crafts spend between one and four years learning their trade - 80% of the time on-the-job under the supervision of a certified journeyman or qualified tradesperson. The balance of the program is technical training in the theory, skills and technologies of their trade.

To become certified journeymen apprentices must learn theory and skills, and they must pass examinations. Requirements for certification - including the content and delivery of technical training - are developed and updated by the Alberta Apprenticeship and Industry Training Board (the Board) and a network of local and provincial industry committees.

The graduate of the Ironworker - Metal Building Systems Erector apprenticeship training is a journeyman who will be able to:
understand the principles of drafting, how drawings originate, their purpose, and how to correctly interpret the information therein. The use of each type of drawing, part work order sketches, materials lists and specification sheets.

relate to all applicable Codes and Regulations with reference to materials specifications, uses and safety for one storey pre-engineered metal building systems.

use hand tools and powered equipment in a proper and safe manner.

calculate material quantities.

perform a satisfactory operation with oxy-fuel or electric arc welding equipment in order to facilitate this work.

relate to the work of other tradesmen in affiliated trades.

supervise, train and coach apprentices.

Due to the nature of the work of the Metal Building Systems Erector, it is imperative that safety be taught on a continuous basis throughout the entirety of this program.

Special emphasis should be placed on weak areas of theory and shop that are evident from progressive tests and examinations administered throughout the course. The time required for such examinations and tests, shall be allowed for in each area of instruction.

Apprenticeship And Industry Training Committee Structure

While government supports Alberta's apprenticeship and industry training system, it is driven by industry, a term which includes both employers and employees. The Alberta Apprenticeship and Industry Training Board, with the support of Alberta Learning, oversees the system. But the system relies on a network of industry committees. These committees include local and provincial apprenticeship committees (LACs and PACs) in the designated trades and occupational committees in the designated occupations, as well as other committees such as provisional committees established before the designation of a new trade or occupation comes into effect. All these committees are composed of equal numbers of employers and employees. The network of industry committees is the foundation of Alberta's apprenticeship and industry training system.

Local Apprenticeship Committees (LAC)

Wherever there is activity in a trade, the Board can set up a LAC. The Board appoints equal numbers of employees and employers for terms of up to three years. The committee appoints a member as presiding officer. Local Apprenticeship Committees:

monitor the apprenticeship system, and the progress of apprentices in their trade, at the local level

help settle certain kinds of issues between apprentices and their employers

recommend improvements in apprenticeship training and certification to their trade's provincial apprenticeship committee

make recommendations to the Board regarding the appointment of members to their trade's PAC.

Provincial Apprenticeship Committees (PAC)

The Board establishes a PAC for each trade and, based on PAC recommendations, appoints a presiding officer and equal numbers of employees and employers for terms of up to three years. Most PACs have nine members. PACs

identify the training needs and content for their trade

recommend to the Board the standards for training and certification for their trade

monitor the activities of local apprenticeship committees in their trade

make recommendations to the Board about the designation of trades and occupations

determine whether training of various kinds is equivalent to training provided in an apprenticeship program in the trade

may participate in resolving any apprenticeship-related disputes between employers and employees

Ironworker – Metal Building Systems Erector PAC Members

Mr. A. O'Neill.....	Calgary	Presiding Officer
Mr. R. Calver.....	Calgary	Employer
Mr. W. McKee.....	Calgary	Employer
Mr. D. Heinrichs.....	Edmonton	Employer
Mr. L. Raboud.....	Slave Lake.....	Employer
Mr. M. Bergeron.....	Calgary	Employee
Mr. W. Bienz.....	Calgary	Employee
Mr. S. Hildebrand.....	Edmonton	Employee
Mr. D. Laboucan.....	Edmonton	Employee

The Alberta Apprenticeship and Industry Training Board (Board)

The mandate of the Alberta Apprenticeship and Industry Training Board relates to the standards and requirements for training and certification in programs under the *Apprenticeship and Industry Training Act*. The Board provides advice to the Minister of Learning on the training and certification of people in designated trades and occupations and on the needs of the Alberta labour market for skilled and trained persons. The Board also makes orders and regulations respecting standards and requirements for apprenticeship programs and the training of apprentices and for training and certification in designated trades and occupations, and the criteria or requirements for granting and recognizing trade and other certificates.

The 13-member Board consists of a chair, eight members representing trades and four members representing other industries. The trades and other industry members are equally represented by employer and employee representatives.

Safety Education

Safe working procedures and conditions, accident prevention and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, employers, employees and the public. Therefore, it is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to or cause an accident or injury.

It is generally recognized that a safe attitude contributes to an accident free environment. Everyone will benefit as a result of a healthy safe attitude towards prevention of accidents.

A tradesperson is possibly exposed to more hazards than any other person in the work force and, therefore, should be familiar with and apply the Occupational Health and Safety Act and Regulations dealing with personal safety and the special safety rules applying to each task.

Legal and Administrative Aspects of Safety

Accident prevention and the provisions of safe working conditions are the responsibilities of an employer and employee.

Employer's Responsibilities:

The employer is responsible for:

- providing and maintaining safety equipment and protective devices.
- ensuring proper safe work clothing is worn.
- enforcing safe working procedures
- providing safeguards for machinery, equipment and tools.
- observing all accident prevention regulations.
- training employees in the safe use and operation of equipment.

Employee's Responsibilities:

The employee is responsible for:

- working in accordance with the safety regulations pertaining to the job environment.
- working in such a way as not to endanger themselves or fellow employees.

Workplace Health and Safety's Responsibilities:

Workplace Health and Safety (Alberta Human Resources and Employment) will conduct periodic inspections of the workplace to ensure that safety regulations for industry are being observed.

Technical Training Establishments

Alberta Learning, Apprenticeship and Industry Training offer your apprenticeship training program. Staff and facilities for delivering the program are supplied by Northern Alberta Institute of Technology (South Campus).

Procedures for Recommending Revisions to the Course Outline

Apprenticeship and Industry Training, Industry Programs and Standards has prepared this course outline in partnership with the Ironworker – Metal Building Systems Erector Provincial Apprenticeship Committee.

This course outline has been prepared by the Industry Programs and Standards of the Apprenticeship and Industry Training in partnership with the Provincial Apprenticeship Committee for the trade.

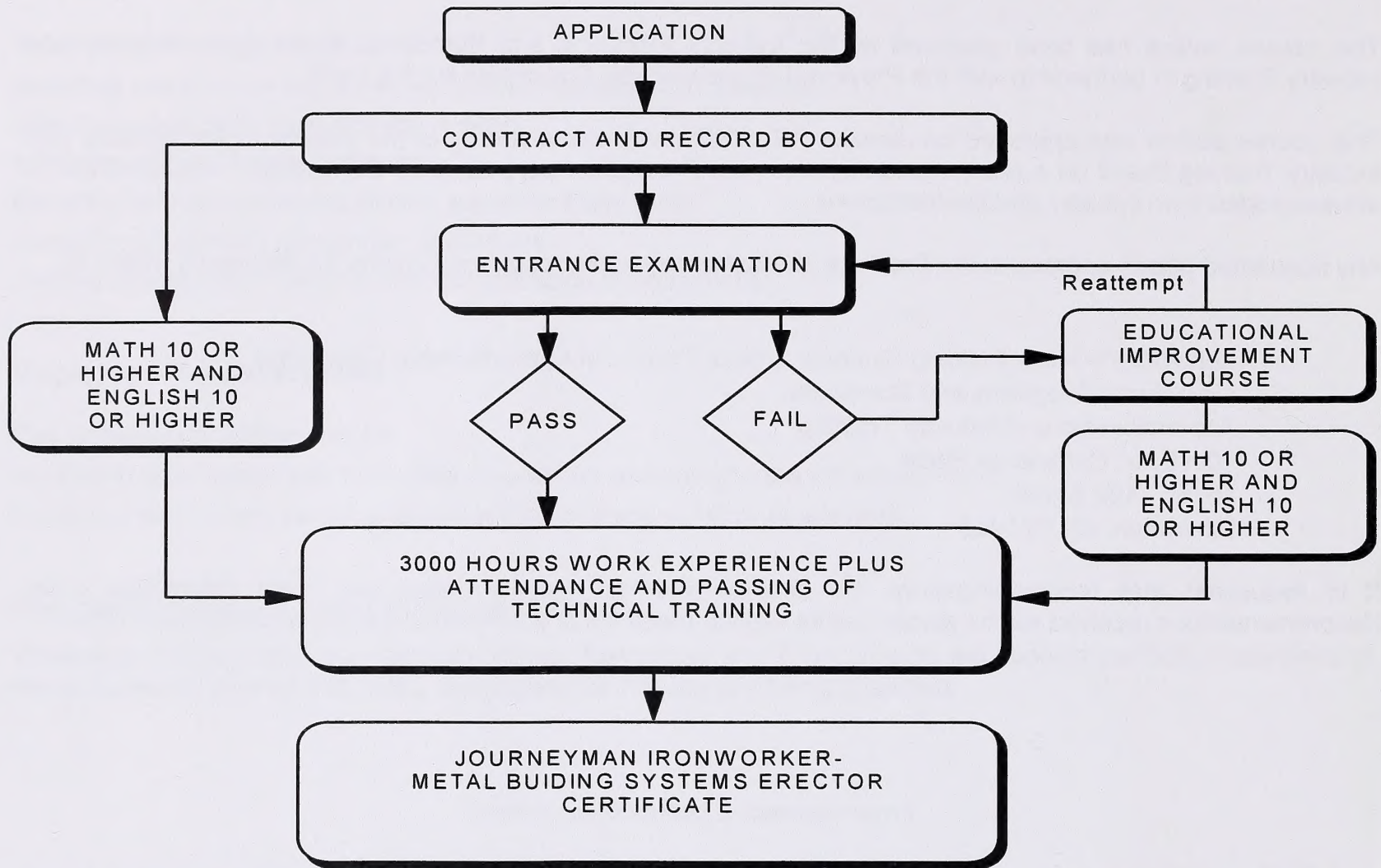
This course outline was approved on January 15, 2003 under the authority of the Alberta Apprenticeship and Industry Training Board on a recommendation from the Provincial Apprenticeship Committee. Valuable input is acknowledged from industry and the institutions.

Any concerned citizen or group in the Province of Alberta may make recommendations for change by writing to:

Ironworker – Metal Building Systems Erector Provincial Apprenticeship Committee
c/o Industry Programs and Standards
Apprenticeship and Industry Training
10th floor, Commerce Place
10155 - 102 Street
Edmonton, AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used. Recommendations received will be placed before regular meetings of the Provincial Apprenticeship Committee.

Apprenticeship Route Toward Certification



Metal Building Systems Erector Training Profile
First Period
(6 Weeks 30 Hours Per Week – Total 180 Hours)

SECTION ONE

GENERAL SAFETY
46 Hours



A

Ironworker Apprenticeship
 Training Program Orientation
2 Hours

B

Hand and Power Tools
16 Hours

C

Safety
4 Hours

D

Lab Practices
24 Hours

E

Emergency First Aid and
 CPR Perquisite to obtaining
 Journeyman Status

SECTION TWO

**OXY-FUEL EQUIPMENT AND
 TACK WELDING**
36 Hours



A

Oxy-Fuel Equipment
 and Cutting
9 Hours

B

Electric Arc Welding
9 Hours

C

Basic Welding Lab Practices
18 Hours

SECTION THREE

**DRAWING INTERPRETATION
 AND MATHEMATICS**
40 Hours



A

Introduction to Drawings
16 Hours

B

Trade Mathematics
24 Hours

SECTION FOUR

LEVEL ONE RIGGING
58 Hours



A

Ropes and Fittings
12 Hours

B

Hoisting Devices
6 Hours

C

Introduction to Load Charts
2 Hours

D

Signals
2 Hours

E

Level One Rigging
 Lab Practices
18 Hours

F

Scaffolding
3 Hours

G

Swing Stage and Aerial Work
 Platforms
3 Hours

H

Fall Protection
2 Hours

I

Scaffolding, Swing Stage
 and Fall Protection Lab
 Practices
10 Hours

Second Period
(6 Weeks 30 Hours Per Week – Total 180 Hours)

SECTION ONE		A	B	C	
DRAWING INTERPRETATION AND MATHEMATICS	⇒	Drawings	Material Designations	Mathematics	
		54 Hours	18 Hours	12 Hours	24 Hours
SECTION TWO		A	B	C	
LEVEL TWO RIGGING	⇒	Rigging Theory	Rigging Practices	Cranes	
		54 Hours	6 Hours	24 Hours	24 Hours
SECTION THREE		A	B	C	
METAL BUILDING SYSTEMS ERECTOR	⇒	Metal Building Systems Erector Drawing Interpretation	Walls Systems	Roof Systems	
		72 Hours	4 Hours	16 Hours	12 Hours
		D	E	F	
		Pre Engineered Building Erection	Windows, Doors and Air Barrier	Tour (Optional)	
		30 Hours	6 Hours	4 Hours	

The hours stated are for guidance and should be adhered to as closely as possible. However, adjustments must be made for rate of apprentice learning, statutory holidays, registration and examinations for the training establishment and Apprenticeship and Industry Training.

**FIRST PERIOD TECHNICAL TRAINING
METAL BUILDING SYSTEMS ERECTOR TRADE
COURSE OUTLINE**

**UPON SUCCESSFUL COMPLETION OF THIS COURSE THE APPRENTICE SHOULD BE ABLE TO PERFORM THE
FOLLOWING OUTCOMES AND OBJECTIVES.**

SECTION ONE:GENERAL SAFETY..... 46 HOURS

A. Ironworker Apprenticeship Training Program Orientation 2 Hours

Outcome: *Describe the responsibilities and opportunities in the Ironworker Trade*

1. Describe the apprenticeship training system in Alberta.
2. Identify the training profile of Ironworker Apprenticeship in Alberta.
3. Explain the Ironworker program outline learning outcomes and objectives.
4. Describe the responsibilities for the Contract of Apprenticeship by the apprentice, employer and Alberta Apprenticeship and Industry Training.
5. Identify industrial, commercial and construction fields that provide employment opportunities for ironworkers.
6. Discuss the contents of the apprenticeship training record book.
7. Demonstrate the ability to complete an acceptable resume.

B. Hand and Power Tools..... 16 Hours

Outcome: *Use hand and power tools*

1. Describe and demonstrate the safe use of hand and power tools.
2. Describe the safe use of typical tools used in the trade:
 - a) measurement, layout and alignment tools
 - b) squaring and marking tools
 - c) heating, cutting and bending tools
 - d) punching, boring and drilling tools
 - e) securing and assembly tools
 - f) prying and dismantling tools
 - g) clamping tools
 - h) grinding tools
3. Describe the types and bonds of grinding stones.
4. Demonstrate safety procedures for dressing grind stones.
5. Describe the types of layout tools and their uses.
6. Describe uses of tape measures, squares, scribes, centre punches trammels and chalk lines.
7. List and describe:
 - a) drill sizes
 - b) drill speeds and feeds
 - c) materials and cutting fluids
 - d) uses of countersinking points

8. Describe and demonstrate the correct use of levelling instruments.
9. Describe and demonstrate the correct use of a transit level.
10. List the advantages of a transit level.
11. Define and describe a spirit level, laser levels.

C. Safety 4 Hours

Outcome: *Use general safe work practices*

1. Recognize and correct common causes of accidents in the work environment:
 - a) inattention to work
 - b) alcohol and drugs
 - c) prescription drugs
 - d) ineffective guarding
 - e) inadequate housekeeping
 - f) attitude
 - g) improper use of tools
 - h) unsuitable clothing
 - i) excessive haste
 - j) fire
 - k) horse play
 - l) lack of instruction
2. Identify the safety regulations as they apply to safe work practices in the trade on:
 - a) general safety precautions
 - b) house keeping, personal protective equipment and clothing
 - c) guards
 - d) grinding
 - e) rigging
3. Describe and apply safety regulations on:
 - a) use of safeguards
 - b) ladders
 - c) protection from fallings materials
 - d) fall protection systems
 - e) scaffolds, bracket, poles, rolling, and power lifts
 - f) floor and roof openings, perimeter guardrails
 - g) temporary floors, temporary supporting structures

D. Lab Practices 24 Hours

Outcome: *Demonstrate the ability to do the following:*

1. Demonstrate the ability to cope and punch holes using the ironworker machine.
2. Demonstrate the ability to start and finish a project from an approved drawing by:
 - a) laying out a fabrication
 - b) cutting steel with oxy-fuel cutting equipment and ironworker to suit layout
 - c) tack welding components together without distortion
 - d) grinding welds on frame and clean up project

E. Emergency First Aid and CPR - Prerequisite to Obtaining Journeyman Status

Completion of the first-aid course is the responsibility of the apprentice and must be supplied with record book completed prior to obtaining Journeyman Certification.

Administer immediate on-the-spot first aid to persons with minor injuries and administer temporary emergency first aid to the more seriously injured, as deemed adequate until a qualified medical personnel is available.

1. Explain the responsibilities and duties of the first aid person.
2. Explain the diagnoses for:
 - a) respiratory failure
 - b) burns
 - c) body injury
3. Applying artificial respiration.
4. Explain the process of freeing the victim of breathing restrictions.
5. Explain the process of applying mouth-to-mouth respiration.
6. Applying emergency treatment.
7. Describe the procedure for:
 - a) assessing injury
 - b) moving the patient
 - c) arresting bleeding
 - d) completing Workers' Compensation Board forms
8. Treating burns.
9. Explain the methods of:
 - a) quenching fire on a victim
 - b) treating various burns
10. Basic one-rescuer CPR.
11. Explain what cardiovascular disease is and how it kills.
12. Explain how to recognize cardiovascular emergencies (severe angina, heart attack, cardiac arrest, etc.) and choking by their signs and symptoms.
13. Demonstrate how to respond effectively to cardiovascular and choking emergencies.

SECTION TWO:..... OXY-FUEL EQUIPMENT AND TACK WELDING 36 HOURS

A. Oxy-Fuel Equipment and Cutting..... 9 Hours

Outcome: ***Demonstrate the knowledge of cutting equipment***

1. Describe oxy-fuel equipment.
2. Describe the construction of the oxygen and acetylene cylinders.
3. Explain the procedure for handling, transporting and storing cylinders.
4. State the procedure for handling faulty cylinders.

5. Explain the construction and purpose of a manifold.
6. Describe the purpose of regulator.
7. Describe the basic construction and pressures involved for a single stage and double stage regulator.
8. Explain the construction of hoses.
9. Identify hoses and fittings.
10. Explain the CSA specifications of hoses.
11. State the procedure for the repair and maintenance of hoses.
12. Describe the design and construction of cutting tips.
13. Describe and demonstrate the care, maintenance and selection of tips.
14. Demonstrate and explain the assembly of oxy-fuel equipment.
15. Explain and demonstrate the correct placement and securing of cylinders.
16. Explain and demonstrate the clearing and checking of cylinder valves.
17. Attach regulators safely and correctly.
18. Attach hoses and explain reason for cleaning new hoses.
19. Attach correctly the barrel and tip.
20. Explain the correct procedure in checking for leaks.
21. Check to assure that the regulators were not used for any other purpose than for what they were intended.
22. Demonstrate the correct pressures and flame adjustments.
23. Explain and demonstrate the correct regulator adjustments and balancing pressures.
24. List the reasons for backfires and flashbacks.
25. Define flame propagation.
26. Ignite the torch using the recommended striker.
27. Explain and demonstrate the different types of flames and uses.
28. List and demonstrate the acceptable shutting down procedure.
29. Demonstrate the fire prevention and controls for oxy-fuel equipment.
30. Identify the types of fire extinguishers available and where used.
31. Define hazardous areas in construction.
32. Describe how to prevent fires.

B. Electric Arc Welding 9 Hours**Outcome: *Identify SMAW Equipment***

1. Explain basic electricity.
2. Define arc voltage.
3. Define alternating current and direct current.
4. Define resistance.
5. Explain duty cycle.
6. Define reverse and straight polarity.
7. Explain the heat distribution using reverse or straight polarity.
8. Explain voltage loss.
9. Demonstrate the knowledge of arc welding machines.
10. Describe the basic components and operation of various types of welding machines.
11. Describe the basic components and operation of A.C. - D.C. rectifier.
12. List the advantages and disadvantages of the various types of welding machines.
13. Explain the selecting, installing and maintenance of welding machines.
14. Explain the reasons for selecting a welding machine for a specific task.
15. Explain the consideration to be taken when installing a welding machine in a shop environment.
16. Explain the day-to-day maintenance required for welding machines.
17. Describe the accessories for welding machines.
18. Describe cable construction.
19. Explain cable sizing.
20. Describe the various types of electrode holders and explain the maintenance required.
21. Describe cable lugs, quick connectors and ground clamps.
22. Describe the controls on arc welding equipment.
23. Explain the arc characteristics in relation to the different voltage and amperage settings.
24. Identify mild steel welding electrodes.
25. Explain the numerical definitions of electrodes.
26. Explain the manufacturing specification control.
27. List the functions of the coating.
28. List the functions of the slag.
29. Explain the effects of alloy additions to the coating.

30. Explain static and dynamic loading.
31. Identify the types of welds:
 - a) fillet
 - b) groove
 - c) plug or slot
32. Identify the types of joints:
 - a) butt
 - b) lap
 - c) edge
 - d) tee
 - e) corner
33. Identify basic weld and welding symbols:
 - a) weld symbols
 - b) parts of the welding symbol
 - c) define arrow side and other side
34. Identify the types of basic weld faults.
35. Describe and define dimensional defects like warpage and wrong measurements.
36. Describe and define notch effect.
37. Describe and define surface and internal defects like slag inclusions, porosity and lack of fusion.
38. Describe and define GMAW, FCAW, GTAW, SAW, PAW, CAC-A and stud welding equipment.
39. Describe welding safety.
40. Describe and wear proper welding apparel.
41. Describe and wear proper welding goggles.
42. Describe the process for fireproofing materials.
43. State the use of protective screens.
44. Describe a welding helmet and illustrate the proper placement of lenses.
45. Describe and illustrate safe housekeeping practices.
46. List the rays involved with welding and the effects associated with these rays.
47. Describe the procedures to protect oneself and the general public from harmful rays.
48. List the reasons for grounding of electrical equipment.

C. Basic Welding Lab Practices 18 Hours

Outcome: *Demonstrate the ability to safely operate a hand held oxy-fuel cutting torch and SMAW equipment*

1. Demonstrate the ability to safely operate a hand held oxy-fuel cutting torch on available plate and structural shapes.
2. Perform safe set-up procedures.
3. Perform correct regulator adjustments and balancing pressures.

4. Perform straight line and bevel cutting on plate steel.
5. Perform cuts on various structural steel shapes.
6. Perform cutting of boltholes in structural shapes.
7. Coping and fitting of various structural shapes into each other.
8. Demonstrate the ability to tack weld.
9. Demonstrate the ability to weld surface welds (stringer beads) in the flat position on available mild steel using E7018 (E48018) filler material.
10. Demonstrate the ability to weld fillet welds in the 2F position using E6010 (E41010) filler material on available steel.
11. Demonstrate the ability to weld fillet welds in the 2F position using E7018 (E48018) filler material on available steel.

SECTION THREE: DRAWING INTERPRETATION AND MATHEMATICS 40 HOURS

A. Introduction to Drawings 16 Hours

Outcome: *Identify types of drawings*

1. Identify the types of drawings:
 - a) perspective drawings
 - b) isometric drawings
 - c) oblique drawings
 - d) orthographic drawings
2. Demonstrate the ability to sketch objects in the orthographic projection.
3. Identify the parts of a drawing:
 - a) lines
 - b) dimensions
 - c) elevation and plan views
 - d) sections
 - e) notes
4. Explain the relationship of drawings.
5. Explain the requirements for architectural drawings.
6. Explain thereasons for structural, mechanical, electrical, pre-engineered fabrication and erection and placing drawings.
7. Identify and demonstrate the use of drawing standards:
 - a) tile block
 - b) drawing number
 - c) contract numbers
 - d) scale
 - e) revisions
 - f) engineers stamp
8. Identify symbols and abbreviations:
 - a) abbreviations used on drawings
 - b) symbols used on drawings
 - c) structural steel shapes
 - d) structural steel connections

- e) basic welding symbols
- 9. Demonstrate the ability to free hand sketch:
 - a) structural shapes
 - b) a beam showing dimensions
- 10. Interpretation of basic drawings.

B. Trade Mathematics..... 24 Hours

1. Fractions (120104a)

Outcome: *Solve problems involving fractions*

- 1. Identify key terms and concepts used in working with fractions.
- 2. Change fractions to a common denominator.
- 3. Solve problems using whole numbers and fractions.
- 4. Solve problems using whole numbers and fractions in practical applications.

2. Decimals (120104b)

Outcome: *Solve problems involving decimals*

- 1. Read and write decimal fractions.
- 2. Round decimal fractions to specified place values.
- 3. Convert decimal inches to a fraction with a practical denominator.
- 4. Convert decimal feet to feet and inches with a practical denominator.
- 5. Convert fractions to decimals.
- 6. Add and subtract decimal fractions.
- 7. Multiply and divide decimal fractions.

3. Percentage and Ratios (120104c)

Outcome: *Solve problems involving percentage and ratios*

- 1. Convert between fractions and percents.
- 2. Convert between decimals and percents.
- 3. Calculate ratio problems: two quantities in the form of a ratio and two ratios in the form of a proportion.
- 4. Solve percent problems.

4. Metric and Imperial Measurement (120104d)**Outcome:** *Solve problems involving Metric and Imperial measure*

1. Identify commonly used metric units of measurement.
2. Convert between units of measurement.
3. Convert imperial units: feet to inches, square inches to square feet, and cubic measures to gallons.

5. Geometric Formulas (120104e)**Outcome:** *Solve problems involving geometric formulas*

1. Identify key terms and concepts used in working with formulas.
2. Identify common formulas for perimeter, area and volume.
3. Solve problems using common formulas for perimeter, area and volume.
4. Calculate the capacity of a container in gallons.
5. Calculate the weight of a solid.

SECTION FOUR:LEVEL ONE RIGGING..... 58 HOURS**A. Ropes and Fittings 12 Hours****Outcome:** *Apply safe work practices and procedures when rigging*

1. Identify and define wire ropes.
2. List the types of steel for wire rope.
3. List and explain:
 - a) basic types of lays
 - b) advantages of lays
 - c) available type of core
 - d) where cores are used
4. Describe the four basic classifications of wire rope.
5. Explain W.W.L. (working load limits) and when a wire rope is unsafe.
6. Identify and define fibre ropes.
7. Define lays of fibre rope.
8. Describe why a certain fiber would be used.
9. List factors and formulas for natural and synthetic fiber ropes.
10. Describe types of synthetic ropes why and when used.
11. Identify and list the use of various knots and hitches.

12. Identify and define synthetic slings.
13. Explain formulas for different types of synthetic slings.
14. Explain proper methods of care and handling of slings.
15. List and describe wire rope fittings.
16. List and describe uses of the following fittings:
 - a) clips
 - b) sockets
 - c) thimbles
 - d) rings
 - e) shackles
 - f) hooks
17. Describe how proof loading works.
18. List and describe formulas and their uses for:
 - a) slings
 - b) guys
 - c) chains
 - d) clips
19. Identify and describe rigging aids.
20. Identify and describe the uses for:
 - a) spreader bar
 - b) balance beam
 - c) equalizing beam

B. Hoisting Devices 6 Hours

Outcome: Identify and describe hoisting devices

1. List and describe manual and power assisted hoisting devices.
2. List and describe cranes:
 - a) types of mobile cranes
 - b) parts of a mobile crane
 - c) parts of a crawler crane
 - d) safe operating and working practices for cranes

C. Introduction to Load Charts 2 Hours

Outcome: The ability to identify parts of load charts

1. List and describe the following parts of a load chart:
 - a) type of crane base
 - b) type of crane configuration
 - c) areas of operation
 - d) length of boom
 - e) angle of boom
 - f) load radius

D. Signals 2 Hours**Outcome: *Identify and demonstrate the use of signals***

1. List and demonstrate signals used for:
 - a) moving equipment
 - b) hoisting
2. Describe methods and precautions in using hand signals.
3. Describe and demonstrate the use of voice communications:
 - a) radio (2 way and walkie-talkie)
 - b) intercom (station to station)
4. Describe precautions used in voice communication.

E. Level One Rigging Lab Practices..... 18 Hours**Outcome: *Demonstrate the safe use of hoisting equipment***

1. Demonstrate slings and hitches used for preparing and lifting materials.
2. Demonstrate the ability to tie knots and hitches and be aware of load limits:
 - a) bowline
 - b) clove hitch
 - c) sheet bend
 - d) scaffold hitch and self-centering bowline
 - e) bowline on a bight
3. Demonstrate the proper use of slings and tag lines.
4. Demonstrate proper use and location of slings for lifting:
 - a) smooth heavy loads
 - b) long flexible loads
 - c) off balance loads
 - d) fragile loads
5. Identify Working Load Limits (W.L.L.).
6. Test knots and splices.

F. Scaffolding3 Hours**Outcome: *Apply safe work practices when using scaffolding***

1. Identify scaffold systems and structures:
 - a) scaffold components and materials
 - b) scaffold safety and access
 - c) tying and bracing scaffolds
 - d) base conditions for scaffolds
 - e) erection and dismantling procedures
 - f) needle beam platform
2. List and describe safety rules for access structures.

G. Swing stage and Aerial Work Platforms3 Hours**Outcome: Apply safe work practices when using swing stage and aerial work platforms**

1. Describe and explain:
 - a) conventional swing stage
 - b) platform components
 - c) thrust outs and support hooks
 - d) wall rollers and tie offs
 - e) manual winches
 - f) power swing stage hoists
 - g) fall arrest equipment
 - h) wire rope and fittings
 - i) swing stage safety rules and regulations
 - j) accident awareness
 - k) check list, precautions, inspections and maintenance
2. Describe the safe use of aerial work platforms and forklifts.
3. Describe common types of material and personnel lifts and their components.
4. Describe acceptable safety precautions to be used when operating material and personal lifts.
5. Introduce load charts for aerial work platforms and forklifts.

H. Fall Protection2 Hours**Outcome: Demonstrate and describe the safe use of fall protection systems**

1. Demonstrate and describe the safe use of fall protection systems.
2. Identify situations where fall protection systems are required.
3. Demonstrate the procedure for correctly fitting a harness.
4. Identify the components for vertical and horizontal lifelines.
5. Describe the procedures for equipment inspections.

I. Scaffolding, Swing Stage and Fall Protection Lab Practical10 Hours**Outcome: Demonstrate the ability to safely use scaffolding, swing stage, aerial work platforms and fall protection systems**

1. Demonstrate the ability to erect the following scaffold systems:
 - a) frame (metal)
 - b) modular
 - c) tube and clamp
2. Demonstrate the ability to use swing stage and aerial work platforms.
3. Demonstrate the ability to use fall protection systems.

**SECOND PERIOD TECHNICAL TRAINING
METAL BUILDING SYSTEMS ERECTOR TRADE
COURSE OUTLINE**

**UPON SUCCESSFUL COMPLETION OF THIS COURSE THE APPRENTICE SHOULD BE ABLE TO PERFORM
THE FOLLOWING OUTCOMES AND OBJECTIVES.**

SECTION ONE: DRAWING INTERPRETATION AND MATHEMATICS 54 HOURS

A. Drawings 18 Hours

Outcome: *Identify structural steel components*

1. Identify and list structural steel components:
 - a) purlins
 - c) bracing
 - d) bays and bents
 - e) columns
 - f) trusses
 - g) girders
 - h) beams
 - i) girts
2. Identify anchor bolt setting:
 - a) orientation
 - b) grid lines
 - c) anchor bolt patterns
 - d) anchor bolt projection
 - e) shims and grouting
 - f) base plate elevations
 - g) anchor bolt plan
3. Identify single frame structures:
 - a) single frame buildings
 - b) beams and columns
 - c) multi frame buildings
 - d) bracing
4. Identify fabrication drawings:
 - a) fabrication drawings
 - b) gauge, pitch and edge distances
 - c) running dimensions
 - d) fabrication practices
5. Identify erection drawings:
 - a) erection drawings
 - b) marking system
 - c) erection pre-planning
 - d) erection tolerances
 - e) leveling and plumbing
 - f) safety
6. Identify trusses and portal frames:
 - a) components
 - b) spacing
 - c) bracing and bridging
 - d) decking

B. Material Designations 12 Hours**Outcome:** *Identify and describe various structural steel shapes, types and fasteners*

1. Identify structural steel shapes:
 - a) dimensioning of shapes
 - b) types of connections
 - c) mill tolerances
 - d) material specifications
2. Identify structural plates.
3. Identify various plate dimensions.
4. Calculate weight of plates.
5. Identify:
 - a) gauge plate
 - b) expanded metal
 - c) bar grating
 - d) checker plate (4 way safety)
6. Identify structural pipe and tubing:
 - a) pipe and tubing
 - b) sizing and dimensioning
 - c) scheduling of pipe
 - d) illustrations of tubing
7. Identify fasteners:
 - a) types of bolts
 - b) bolt diameters
 - c) bolt grip and length
 - d) methods of installation
 - e) precautions for use
 - f) fasteners to other types of materials

C. Mathematics 24 Hours

The mathematics delivered under this section shall maintain a level applicable to the tradesman, and have a definite relationship to functions experienced in the trade of a Metal Building Systems Erector.

Outcome: *Demonstrate the ability to solve mathematical problems*

1. Demonstrate ability to solve imperial and metric linear measurement problems using:
 - a) fractions
 - b) decimals
 - c) conversions between decimal and fractions
2. Calculate ratios and proportions.
3. Calculate similar triangles.
4. Calculate slopes.
5. Calculate percentages:
 - a) calculate simple interest
 - b) calculate discounts
6. Calculate perimeters and areas of:

- a) squares and rectangles
 - b) triangles
 - c) circular objects
 - d) parallelograms
 - e) irregular shapes
7. Solve area measurement problems using:
 - a) unit of area measure
 - b) conversions of area units
 - c) plane figures (rectangle, circle, etc.)
 8. Solve volume measurement problems using:
 - a) units of volume measurement
 - b) conversions of volume units
 - c) volume figures (cube, cone, etc.)
 9. Calculate quantities related to study of plans and drawings:
 - a) general - scaffolding, equipment use, etc.
 - b) cutting list for specified projects
 - c) fasteners required
 10. Define triangulation using the appropriate formulas, calculate a position by means of bearings from two fixed points a known distance part.

SECTION TWO:..... LEVEL TWO RIGGING 54 HOURS

A. Rigging Theory 6 Hours

Outcome: *Describe types of rigging procedures*

1. List and describe formulas.
2. Perform calculations with rigging formuls:
 - a) deadman
 - b) drum capacities
 - c) sheaves
 - d) stress formulas
3. List and describe the following:
 - a) sling configurations
 - b) methods of transferring loads
 - c) safety rules for handling pre-cast objects
4. Apply the W.L.L. into various load and sling configurations.
5. Use slings and general rope hardware tables and charts.
6. Determine the working load limt that can be lifted with a given rigging arrangement.

B. Rigging Practices 24 Hours

Outcome: *Apply safe rigging practices*

1. Slings.
2. Determine the center of gravity for different types of loads such as:
 - a) structural members of different designations

- b) regular plates
 - c) precast
 - d) components
 - e) machinery
- 3. Demonstrate the use of sling stress formulas.
- 4. Hoisting and jacking equipment.
- 5. Perform rigging, hoisting and jacking operations in a safe and responsible manner in accordance with the Health and Safety Act and any other applicable regulations.
- 6. Rig loads safely and correctly for:
 - a) straight lifts
 - b) drifting
 - c) turning

C. Cranes 24 Hours

Outcome: *Describe safe procedures for lifting, hoisting or moving loads*

- 1. Crane usage.
- 2. Demonstrate or describe:
 - a) general use of tables and charts
 - b) signals
 - c) boom assembly and disassembly
 - d) components
 - e) breakdown for transportation
 - f) safety precautions
 - g) deductions from gross capacity to determine net capacity
- 3. Describe the reason for and load reduction when jib is fitted on the boom.
- 4. Crane identification.
- 5. Identify and describe the following cranes:
 - a) hydraulic
 - b) conventional
 - c) rough terrain
 - d) high capacity
 - e) tower
- 6. List and describe derricks:
 - a) types of derricks and their uses
 - b) ground rules and safety practices
- 7. Describe and explain uses for guy wires.
- 8. Define and explain the word "dead man".
- 9. Describe and explain winches:
 - a) winches and their uses
 - b) a drum and its capacity
 - c) safety rules
- 10. Sketch sheave and define sheave size.
- 11. Demonstrate the knowledge of signals.

12. List the basic conditions for counterweight installation and removal.

SECTION THREE: METAL BUILDING SYSTEMS ERECTOR..... 72 HOURS

A. Metal Building Systems Erector Drawing Interpretation. 4 Hours

Outcome: *Demonstrate the ability to read and understand metal building systems drawings*

B. Wall Systems 16 Hours

Outcome: *Describe metal building walls*

1. Describe the terminology of wall systems.
2. Explain panel profile, gage number and panel coatings.
3. Describe and differentiate between exposed fastener panels and concealed fastener panels.
4. Discuss the field storage and handling of wall panels.
5. Describe types of factory-assembled wall panels.
6. Describe layout and installation of walls.
7. Describe sheeting safety considerations.
8. Install a base angle using masonry fasteners.
9. List and describe tools required for installing wall coverings.
10. Describe the shakeout, rigging, and handling of wall coverings.
11. Describe the process used to align girts with blocking.
12. Lay out modularity prior to installing wall coverings.
13. Describe how the direction of sheeting is determined.
14. Describe the procedure used to predrill a stack of wall panels.
15. Discuss the procedures used to install:
 - a) exposed wall fastener wall panels
16. Describe and demonstrate correct scaffolding practices common to wall installation practices.
17. Describe and demonstrate how to cut an opening in an exposed fastener wall panel including:
 - a) framing
 - b) flashing
18. Discuss considerations when sheeting end walls.
19. Describe the cutting and installation of factory-assembled wall panels.
20. Sandwich panel systems.

B. Roof Systems12 Hours**Outcome: Describe metal building roof systems**

1. Describe panel types and systems design.
2. Describe the various loads to which a metal roof is subjected.
3. List and describe the components of lap seam metal roofs.
4. State common characteristics shared by standing seam metal roof systems.
5. Discuss and describe the:
 - a) advantages and limitations of standing and lap seam metal roofs
 - b) types of coatings used on standing and lap seam metal roof panels
 - c) sealant requirements for standing and lap seam systems
6. Describe the safety involved in working on roofs.
7. Discuss safety considerations when working off the ground.
8. Describe the potential panel dangers during metal roofing:
 - a) collapse
 - b) slippery
 - c) loose panels
 - d) wind
9. Discuss material handling dangers.
10. Describe installation of metal roofs with lap seams, standing seams and sandwich systems.
11. State the factors considered in pre-erection planning.
12. Describe the general sequence of erection for standing seam roof systems.
13. Discuss eave conditions, ridge conditions and rake conditions.
14. Discuss skylights, curbs and walkway systems.
15. Describe the procedures used to block purlins according to manufacture's specifications.
16. Describe insulation placement in conformance with the requirements of the specified roof system.
17. Describe procedure used to lay out panel modularity.
18. Describe the installation of roof and ridge panels in conformance with the requirements of the roof system.
19. Describe proper splicing of gutter sections .

D. Pre-Engineered Building Erection.....30 Hours**Outcome: Apply safe work practices when erecting a pre-engineered metal building**

1. Demonstrate the ability to do the pre-planning for a pre-engineered building.
2. Determine size and weight of building materials.
3. Determine the sequence for erecting the structural steel.
4. Determine the size of the mobile crane needed and the location of crane on site.

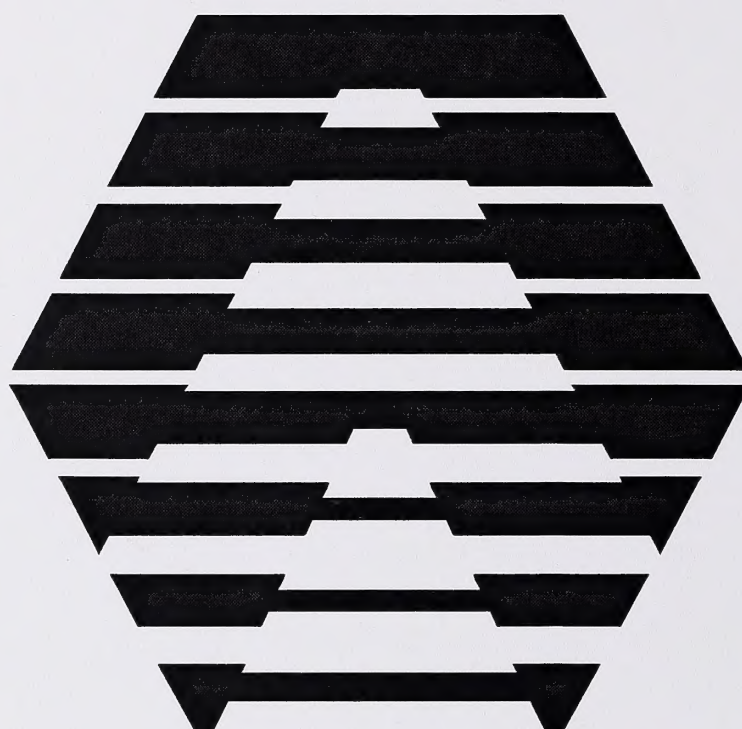
5. Check levels of the base and anchor bolt patterns.
6. Ensure that all materials are on site.
7. Apply safe work practices and procedures for use of mobile cranes:
 - a) locate and level mobile crane on site
 - b) rig up the mobile crane using the correct slings
 - c) use correct hand signals for hoisting material
 - d) follow safe hoisting procedures
8. Demonstrate the ability to erect a pre-engineered metal building:
 - a) hoist and locate the columns in the correct location
 - b) level and square columns on the bases
 - c) install temporary guys
 - d) plumb and square the structural frame using guy lines, bracing, leveling shims and transit
 - e) hoist, erect and bolt all secondary structural and bracing in the correct position
 - f) torque bolts to proper specifications
 - i) impact
 - ii) turn of nut method
 - g) install wall and roof systems
 - h) use recognized safety procedures
9. Demonstrate the ability to dismantle a metal building:
 - a) loosen all bolts in correct sequence
 - b) dismantle and lower all structural steel and metal building components in the correct sequence
 - c) place in storage all structural steel and metal building components using correct and safe methods
 - d) de-rig the mobile crane using appropriate safety procedures
 - e) clean up site

E. Windows, Doors and Air Barrier 6 Hours

Outcome: *Describe proper installation of windows, doors and air barrier*

1. Describe and discuss insulation backings used as vapour barriers.
2. Other types of air barriers:
 - a) polyurethane
 - b) liner panels (caulked and sealed)
3. Describe cutting rough openings for windows and doors:
 - a) while sheeting
 - b) after building is sheeted
4. Explain finishing of openings:
 - a) sealants required
 - b) flashings
 - c) insulation

F. Tour (Optional) 4 Hours



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